

# THE COLUMBIA ICE-FIELD





# THE COLUMBIA ICE-FIELD

Department of Resources and Development  
Development Services Branch  
National Parks and Historic Sites Service  
Ottawa, Canada

← Athabasca Glacier—Columbia Ice-field showing Snow Dome in background. Jasper National Park, Alberta



# The Columbia Ice-field

\*

The Columbia Ice-field, centre of the greatest known accumulation of ice in the Rocky Mountains, is not only one of the most interesting ice-fields in North America, but certainly one of the most accessible. Near the Banff-Jasper Highway, it lies astride the British Columbia-Alberta boundary and at the dividing line between Banff and Jasper National Parks.

With its outlet glaciers, the Columbia Ice-field covers an area of nearly 130 square miles, of which fully 50 square miles are more than 8,500 feet above sea level in the area of accumulation, usually called the "neve". From the great central ice reservoir, lying between Snow Dome, Mount Chephra, and Mount Columbia and capping the Continental Divide for a distance of about 20 miles, three valleys radiate outward. Through them flow the Athabasca Glacier to the northeast, the Saskatchewan to the east, and the Columbia to the northwest.

From other points smaller ice tongues flow into the surrounding valleys, and in a number of places ice tumbles over precipices to form reconstructed glaciers such as Dome Glacier at the head of Habel Creek, and the northward flowing glacier between Mounts Columbia and King Edward.

The Columbia Ice-field is the source of three great rivers — the 765-mile Athabasca, a sub-tributary of the Mackenzie River, which flows into the Arctic Ocean; the Saskatchewan (1,205 miles) which crosses the Prairies and empties into Lake Winnipeg and, via the Nelson River, into Hudson Bay; and the Columbia (1,210 miles) which cascades its way through scenic gorges, crossing into the U.S.A before entering the Pacific Ocean.

## How are Glaciers Formed?

Glaciers are formed by great depths of snow accumulating in mountain basins at high altitudes. The weight of the snow, assisted by surface melting, causes the lower layers to compact and to form solid ice. Under the pressure exerted, together with gravitational effect, the ice is slowly extruded through the valley outlets of the basin. When the slowly-moving mass of ice in the valley reaches lower altitudes melting takes place during the summer months, forming glacial streams.

← Close-up of the tongue of Athabasca Glacier.



## Why are Glaciers Receding?

The present glaciers are the remnants of the continental ice-cap which once covered a large part of the northern half of this continent. In earlier times glaciers were of much greater extent than at present. The recession of glaciers has been caused by a gradual, long-term cyclic change in climatic conditions, primarily a slight increase in annual mean temperature. Probably there has also been a lower rate of precipitation in the mountains and longer periods of sunshine.

## Movement of Glaciers

Remembering that ice is a hard and brittle solid, it is surprising to find that it can flow like a plastic body under the pull of gravity, but this can easily be proved. Metal plates placed in a row at right angles across a glacier gradually get out of line, the central ones moving fastest, similar to floating debris in a river; but the motion is very slow, even in the middle being seldom more than a few inches a day.

**Crevasses** — As a glacier flows over a rock bed or reaches a space of increased incline, tension is exerted in the upper portion of the ice until it ruptures. Such cracks, but a hairbreadth wide at first, are enlarged by melting and changes of slope until they may become hundreds of feet in length and depth. These are known as crevasses.

**Seracs** — As the glacier advances, those crevasses are bent out of shape and may be crossed by fresh crevasses, splitting up the ice into wild lumps and pinnacles called seracs.

**Ice-falls** — Passing over an uneven bed, the body of the glacier is first bent in one direction and then in the other. When the slope increases, great openings are formed across the glacier which are known as transverse crevasses, as they usually occur almost at right angles to the direction of the flow. The ice at this point may form in great steps with crevasses between them. This is known as an ice-fall.

## Carrying Power

One of the most interesting characteristics of a glacier is its carrying power. Although it is in motion like a plastic substance, it is solid and strong enough to support a tremendous weight. Debris torn from the mountainside obscures its edge, so that often one may walk 50 yards out before the ice can be seen. This fringe of broken rock carried on the edge of the glacier is called a marginal moraine.

← Ice Seracs—Illecillewaet Glacier, Glacier National Park,  
British Columbia.



Athabasca Glacier is easily accessible from the Banff-Jasper Highway.



Rocks, even as large as cottages, now and then roll down upon the ice and are transported without trouble. Medium sized rocks, a few feet across, called glacier tables are left standing on pedestals of ice, as they protect the glacier beneath from the sun, while thawing goes on all around them.

The whole mass of debris is carried steadily onwards until a point is reached where melting is complete and no more burdens can be borne. Then a terminal moraine is built up, a steep and rugged pile of loose rocks.

The shrinkage of the glaciers is illustrated by the number of terminal moraines visible in the valleys in which glaciers descend. The nearest to the present tongue of the ice is almost bare; the next, a few hundred yards away from the tongue, may have bushes growing on it; and others a mile or two away may be covered with forest.

### Glacier Observations

Glacier observations under governmental auspices were undertaken by the Dominion Water and Power Bureau in 1945. Charter and succeeding members of the Alpine Club of Canada, however, made sporadic observations and studies of the variations of a number of glaciers over a long period of years.

### Athabasca Glacier

The Athabasca Glacier has been receding rapidly in recent years. Records of the Water Resources Division of the Development Services Branch, Department of Resources and Development, show that the average yearly recession (1945-1949) has been 102 feet. It has well-defined and apparently recently-formed terminal and marginal moraines. These moraines indicate that at one time Dome and Athabasca Glaciers were joined.

One of the first published photographs of the glacier, taken in 1908, showed that the Athabasca terminus had receded only about 400 to 500 feet from the terminal moraine. Later pictures indicated a recession of perhaps 300 to 400 feet from 1908 to 1919 and 100 to 200 feet from 1919 to 1922. From 1922 to 1948, net recession was approximately 1,750 feet.

Evidence of the recession of other glaciers in the national parks in British Columbia and Alberta may be observed by visitors to these parks. The accompanying photographs of Crowfoot Glacier, near Bow Lake on the Banff-Jasper Highway, show clearly the recession of the lower talus of the glacier over a comparatively short period of years.

— Another close-up of Athabasca Glacier.



Crowfoot Glacier, Banff National Park, Alberta, 25 years ago



Crowfoot Glacier as it is at Present.



*For additional copies of this booklet, or other information on the  
National Parks of Canada, write to:*

Canadian Government Travel Bureau  
**DEPARTMENT OF RESOURCES AND DEVELOPMENT**  
Ottawa, Canada

← Angel Glacier on Mount Edith Cavell, Jasper National Park.

